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PATENT SPECIFICATION

DRAWINGS ATTACHED

1,137,637

Date of Application and filing Complete Specification:
22 Dec., 1965. No. 54331/65.
Application made in Germany (No. F44795 IVa/53c) on 23 Dec., 1964.
Application made in Germany (No. F45276 IVa/53c) on 18 Feb., 1965.
Application made in Germany (No. F45739 IVa/53c) on 6 April, 1965.
Application made in Germany (No. F46346 IVa/53c) on 16 June, 1965.
Application made in Germany (No. F47888 IVa/53c) on 10 Dec., 1965.
Complete Specification Published: 27 Dec., 1968.

Index at Acceptance:—A5 G13

Int. Cl.:—A 23 b 1/04

COMPLETE SPECIFICATION

A method of producing a smoking fluid for foodstuffs and an apparatus therefor.

...The resulting distillate is diluted...

ERRATUM

SPECIFICATION NO. 1,137,637

Page 7, line 18, *after* "the" *delete* "root diameter of said conveyor" *substitute* "pitch of said screw decreases"

THE PATENT OFFICE,
21st January 1969

to foodstuffs a smoked flavour, which is the same as or similar to the flavour which is produced by smoking these foodstuffs with wood smoke.

It is known to use as a smoking fluid a liquid which is obtained by introducing wood smoke into water. This has the disadvantage that saw chips or saw dust must be burnt, just as when the foodstuffs are directly treated with wood smoke. Such burning requires fireproof containers. The combustion process, particularly the combustion temperature, and the composition of the smoking fluid, which depends on said temperature, can be controlled only with difficulty. Soot and other tar-containing substances tend to deposit on the walls of the container and may give rise to undesired secondary combustion processes.

In another known process, wood is heated to produce wood gas, which is then condensed and subjected to fractional distil-

some time. It has also been found the apparatus for carrying out the k processes cannot be put into and o operation as quickly as desired becau initiation of the combustion or heati the sawdust takes considerable time ar combustion temperature varies contin Owing to this fact, a constant quality smoking fluid as to the percentage position of its components cannot be en

Another disadvantage of the known cesses resides in that the surplus g vapours which escapes from the t and/or smoking chamber is discl through a relief valve so that there is noxious smell and decontamination surroundings of the smoking chamt flue connections is required.

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SEE ERRATA SLIP AT

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Int. Cl.:—A 23 b 1/04

COMPLETE SPECIFICATION

A method of producing a smoking fluid for foodstuffs and an apparatus therefor.

I, GERHARD FESSMANN, a German citizen of 16 Mozartstrasse, Fellbach near Stuttgart, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a process of preparing a fluid for smoking foodstuffs, such as meat, sausage, fish, ham, cheese, and the like, which are to be subjected to the action of the smoking fluid produced with the aid of sawdust. This process serves to impart to foodstuffs a smoked flavour, which is the same as or similar to the flavour which is produced by smoking these foodstuffs with wood smoke.

It is known to use as a smoking fluid a liquid which is obtained by introducing wood smoke into water. This has the disadvantage that saw chips or saw dust must be burnt, just as when the foodstuffs are directly treated with wood smoke. Such burning requires fireproof containers. The combustion process, particularly the combustion temperature, and the composition of the smoking fluid, which depends on said temperature, can be controlled only with difficulty. Soot and other tar-containing substances tend to deposit on the walls of the container and may give rise to undesired secondary combustion processes.

In another known process, wood is heated to produce wood gas, which is then condensed and subjected to fractional distillation. The resulting distillate is diluted with water. This process is so complicated that the production of the smoking fluid is expensive, and the process requires a combustion, which has the above-mentioned disadvantages.

In the known smoke gas process there must be a flue for discharging the flue gases. The soot and tar components deposit on the walls of the smoking chambers and on the sensing and heating means incorporated in said chambers so that they can no longer satisfactorily perform their function after some time. It has also been found that the apparatus for carrying out the known processes cannot be put into and out of operation as quickly as desired because the initiation of the combustion or heating of the sawdust takes considerable time and the combustion temperature varies continually. Owing to this fact, a constant quality of the smoking fluid as to the percentage composition of its components cannot be ensured.

Another disadvantage of the known processes resides in that the surplus gas or vapours which escapes from the boiling and/or smoking chamber is discharged through a relief valve so that there is an obnoxious smell and decontamination of the surroundings of the smoking chamber, or flue connections is required.

It is an object of the invention to provide a simple process of producing a smoking fluid. More specifically it is an object to provide a process of producing a smoking

SEE ERRATA SLIP ATTACHED

fluid which is free at least of most of the substances which are injurious to health, such as carcinogenic substances. It is another object to provide a process of the type set forth above which can be carried out independently of fixed connections, such as flue connections, and which permits of a storage of the produced smoking fluid.

It is desired to supply flavours or the like in a predetermined manner to the foodstuffs to be smoked. More specifically, it is desired to enable an exact predetermination of the intensity and concentration in which the flavours or the like are to be taken up by the foodstuffs.

It should be possible to smoke the foodstuffs within a short time. The surplus vapour escaping from the smoking chamber or a boiling cabinet or the like should be discharged in a simple manner and so that the surplus vapour condenses quickly and can then be discarded, e.g. through a sewer system. An accurate control of the pressure in the smoking chamber should be possible and reliable protection is required against a re-entrance of atmosphere from the sewer system.

It is another object of the invention to provide an apparatus for carrying out the process and for continuously or intermittently producing the smoking fluid in a uniform and predetermined or adjustable quality. The apparatus should be simple in structure and enable a direct use of the gaseous fluid after its production or a simple storage of the fluid.

The process of producing a fluid for smoking foodstuffs such as meat, sausage, fish, ham, cheese and the like comprises contacting a stream of particulate wood solids located in a trough with superheated steam at a temperature of at least 180°C to effect a thermal decomposition of said wood solids and form said smoking fluid, and moving said wood solids along the trough so that the spent wood solids which have been thermally decomposed by the steam are replaced by unspent wood solids. This has the advantage that the temperature at which flavours or the like are extracted from the sawdust can be exactly controlled so that only the desired substances are recovered from the sawdust. Owing to the use of water vapour, the sawdust cannot be inflamed so that the smoking chambers containing the foodstuffs to be smoked remain clean.

The smoking fluid produced according to the invention if saturated with moisture to appropriately 100% at 70-100°C., preferably 80°C., enables the smoking fluid to be condensed on the foodstuffs to be smoked and a much faster and more intensive transfer of the substances contained in the smoking fluid and their uniform distribution on the surface of the foodstuffs is ensured.

According to a further proposal according to the invention, air or another neutral gas is admixed with the superheated steam before it passes through the sawdust in order to vary the moisture content and the flavour of the smoking fluid.

The steam which has been enriched with flavours, i.e., the smoking fluid, may have water vapour, air or another neutral gas admixed thereto before it contacts the foodstuffs so that the concentration, composition and intensity of action can be controlled. Depending on the amount and temperature of the neutral gas admixed to the smoking fluid, the latter will have a larger or smaller depth of penetration into the foodstuffs so that the taste and moisture content can be selectively changed.

The admixing of water vapour, air or another neutral gas is preferably effected before the liquefaction of the smoking fluid because this ensures a particularly good mixing.

A particularly fast and intense smoking of the foodstuffs will be enabled if the smoking fluid is transferred to the foodstuffs to be smoked by dewing or condensation. This avoids an excessive loss of smoking fluid in a vapour state and ensures a uniform distribution of the smoking fluid on the foodstuffs.

If the smoking fluid is intermittently applied to the foodstuffs during periods of time which succeed in timed intervals, an optimum action of the smoking fluid on the foodstuffs to be smoked will be obtained. The foodstuffs are only slightly heated. This process can be carried out in a simple manner with the aid of a timer which controls the supply of the smoking fluid.

According to another proposal according to the invention, the surplus smoking fluid vapour escaping during the smoking of the foodstuffs is condensed by a liquid coolant. For this purpose the escaping fluid which is vaporous or entrained by a vapour is suitably passed into a vessel which is filled with water. The water level and the water-temperature in the vessel are sensed and are automatically controlled. This ensures a reliable condensation of the vaporous surplus fluid in a simple manner before said fluid is discharged.

In an advantageous development of the process according to the invention, the sawdust flows continuously in the stream from a hopper and is subjected to a coninuous stream of the superheated stream passing therethrough; the rate of flow of the continuously flowing sawdust and of the superheated steam can be adjusted. This ensures a constant quality of the resulting smoking fluid. The height of the stream of sawdust is preferably so large that the uppermost layer of the sawdust is not thermally decomposed

by the superheated steam but acts as a filter layer for the smoking fluid evolved under this layer. This ensures a filtering of the smoking fluid and a removal of undesired substances therefrom so that the quality of the smoking fluid is improved.

Another important feature of the process according to the invention resides in that the vaporous smoking fluid is liquefied at temperatures above 0°C. The known processes enable a liquefaction of the smoking gas only at very low temperature. The gaseous smoking fluids must be cooled to at least −80°C., as a rule, for liquefaction. Another advantage will thus be obtained by the liquefaction of the vaporous smoking fluid at temperatures above 0°C. according to the invention, e.g. by an indirect cooling with water or air.

An apparatus for producing a fluid for smoking foodstuffs, such as meat, sausage, cheese or the like, with the aid of sawdust and superheated steam, is characterised according to the invention in that the apparatus comprises a feeder, which supplies the sawdust into the steam zone and automatically and continuously feeds fresh sawdust to the apparatus so that a constant quality of the resulting smoking fluid is ensured.

The feeder comprises a trough, which is disposed in the steam path and extends preferably transversely thereto. At the inlet end of said trough, a preferably funnel-shaped hopper for the sawdust is provided. This hopper is disposed outside the steam path and can be re-filled from time to time. From the hopper, the sawdust flows in a continuous stream and it is through this stream that the steam passes.

In a further development of the invention, the trough is downwardly inclined from the hopper so that the velocity at which the sawdust flows in the trough can be predetermined in a simple manner. The angle of inclination of the trough and with it the velocity of flow of the sawdust is preferably adjustable, e.g. by adjusting the entire apparatus to a suitable inclination.

According to a further feature of the invention the trough and/or the hopper are mounted for vibration by a vibrator connected thereto. The vibration of the trough and of the hopper causes the sawdust to flow from the hopper into the trough. The vibration causes also a conveyance of the sawdust in the trough.

In another desirable embodiment of the invention, a motor-driven conveyor screw is provided at the inlet end of the trough and this screw is preferably disposed in a duct, which conforms to the outside diameter of the screw and which communicates with the outlet of the hopper for the sawdust and with the inlet of the trough. This enables a supply of sawdust at a metered rate from the hopper into the trough. The sawdust provides for a perfect seal between the hopper and the trough so that no steam can enter the hopper.

According to another feature of the invention, the hopper is succeeded in the direction of flow of the sawdust by an adjustable height limiter, e.g. in the form of a plate, which is urged onto the surface of the sawdust conveyed in the trough and enables an exact adjustment of the height of the sawdust layer which is being conveyed in the trough.

A container for collecting the exhausted sawdust is preferably provided under the output end of the conveyor trough, and the exhausted sawdust drops at the outlet end of the trough into the collecting container. This arrangement enables a substantially uninterrupted operation of the apparatus because the sawdust is continuously supplied to the trough and leaves the same when it has been consumed.

The cross-section of the trough is suitably open at the top and the trough bottom has apertures for the passage of the steam. Under the trough, a controllable superheater for the steam is suitably provided and a controlled steam supply conduit opens into this superheater. The superheater may be preceded by an evaporator e.g., a continuous evaporator, so that it is sufficient to supply water to the apparatus, which water is first evaporated, then superheated and thereafter supplied to the sawdust through the apertures in the bottom of the trough.

According to another proposal according to the invention, the trough, the superheater and the container for collecting the exhausted sawdust are disposed in an insulated housing, which has at the top an opening for discharging the smoking fluid.

It is particularly advantageous if the conveyor trough alternatively has apertures in its sides for the passage of the steam because the sawdust conveyed in the trough is then prevented from falling down from the trough and a particularly uniform contact between the sawdust and the water vapour is ensured.

The opening for discharging the smoking fluid from the insulated housing is preferably connected to a cooling device for cooling the smoking fluid to below its boiling point because the smoking fluid can easily be stored and handled in a liquid state. The cooling device contains suitably a pipe coil for the smoking fluid, which coil extends into a coolant container, and the latter is provided with a thermometer for controlling a solenoid-operated valve, which is incorporated in the coolant supply conduit. This enables an exact control of the supply of the coolant contained in the coolant con-

tainer, such as water, at a constant temperature.

The invention will now be explained more fully with reference to illustrative embodiments shown in the accompanying drawings, in which:—

Fig. 1 is a simplified sectional representation of an apparauts according to the invention;

Fig. 2 is a view similar to Fig. 1 and shows another embodiment of the invention;

Figs. 3 to 5 are simplified fragmentary views illustrating further embodiments of the invention; and

Fig. 6 shows a device according to the invention for cooling the smoking fluid;

Two further embodiments of the conveyor trough are shown in Figs. 7 and 8.

Fig. 7 is a simplified transverse sectional view showing an apparatus according to the invention, and

Fig. 8 is a view similar to Fig. 7 and shows another embodiment of the invention.

As is shown in Fig. 1, an apparatus according to the invention for producing a smoking fluid comprises a conveyor trough 1, which communicates with a hopper 2 for the sawdust 3 and which further communicates through apertures 5 in the bottom 4 of the trough with a superheater 6. The trough is accommodated in a housing 7, which has an outlet 8 for the smoking fluid. The trough bottom may be in the form of a screen of wire mesh to allow the steam to pass therethrough.

The conveyor trough 1 communicates with the hopper 2 disposed outside the housing 7 and is connected by vibration permitting mountings, e.g., in the form of spring elements 10, to the housing 7 and to a control cabinet 9 associated with the apparatus. The trough 1 is mounted so as to be capable of vibration. A magnetic vibrator 11 is provided for producing the vibration. The velocity and rate of conveyance of the sawdust can be changed in a simple manner by adjusting the amplitude of vibration of this magnetic vibrator.

As is also shown in Fig. 1, that portion of the bottom 4 of the conveyor trough 1 which is provided with the apertures 5 is connected by a flexible tube 12 to the superheater 6. That end 14 of the conveyor trough 1 which is accommodated in the housing 7 is disposed over a container 15 for collecting the used sawdust. The housing 7 is provided with insulation 13.

When sawdust 3 is contained in the hopper 2 disposed outside the housing 7 and when the vibrator is in operation the sawdust 3 is fed into the trough 1. The trough 1 is inclined towards its end 14 disposed in the housing 7 so that the sawdust 3 is conveyed by the vibration in the trough in the direction of the arrow 16 past the bottom apertures and finally falls into the container 15. Superheated steam flows from the superheater 6 through the bottom apertures 5 in the direction of arrow 17 into the trough 1 and contacts the sawdust in the trough. As a result of this contact, the steam becomes flavoured with sawdust extracts so that a smoking fluid is obtained, which can then be removed through the outlet 8 provided on the housing 7.

To enable an exact adjustment of the height of the layer of sawdust which moves in the trough 1, a gate 19 extends into the opening 18 which is formed in the hopper 2 and connects the same to the trough 1. This gate determines the height of the layer of sawdust and it is desirable that the height of the layer be less than the length of the trough. The hopper 2 is tightly sealed by a cover 20. Thus the steam and the smoking fluid cannot enter the hopper 2 nor escape through the same.

The superheater 6 comprises a heater 21, which is contained in a housing 22. A steam conduit 23 opens into the housing 22. A temperature sensing element 24 is provided downstream of the heater 21 in the direction of flow of the steam (arrow 17). The rate of the steam flowing into the superheater is exactly controlled by a solenoid valve, not shown, and a rate control valve 25. This steam is heated by the heater 21 to an adjustable temperature and is then passed in the direction of the arrow 17 to the sawdust 3 moving in the trough 1. The temperature sensing element 24 is connected to a temperature controller 26, which is disposed in the control cabinet 9 and controls the temperature of the heater 21. This enables a maintenance of a constant temperature of the steam which is supplied to the sawdust 3.

As is also shown in Fig. 1, an evaporator 27 is disposed under the superheater 6 and communicates with the superheater 6 through an opening 28 in an insulated partition 29. This evaporator 27 is required if no steam supply is available at the location of the apparatus. The continuous evaporator 27 comprises a heater 30. A water conduit 31 incorporating the rate control valve 25, opens into the continuous evaporator 27. An overflow pipe 32 extends into the continuous evaporator. The water entering through conduit 31 into the continuous evaporator 27 is evaporated by the heater 30 and is then passed through the opening 28 to the superheater 6. The water level in the continuous evaporator 27 is maintained constant by the overflow pipe 32.

The control cabinet 9 contains a horn 33 or a similar signalling device, which is connected to a means for checking the level of the sawdust in the funnel-shaped hopper 2. A capacitive or photo-electric measuring method may be used to generate a signal

when the sawdust level has dropped below a predetermined value and new sawdust must be charged.

In the embodiment of the invention shown in Fig. 2, a screw 35 is disposed in a duct 34, which connects the outlet of the funnel-shaped hopper 2a to the trough 1. The crest diameter of the conveyor screw 35 is about the same as the inside diameter of the duct 34.

The conveyor screw 35 is driven by an electric motor 37 and a change-speed transmission 36.

The height of the sawdust 3 in the conveyor trough 1 of Fig. 2 is determined by the plate 38, which is mounted on and adjustable by a screw 39 provided with a handwheel 40.

A particularly good seal between the hopper 2a and the conveyor trough 1 will be obtained if the pitch of the conveyor screw 35 decreases in the direction of conveyance (arrow 16) and/or its root diameter increases in the direction of conveyance (arrow 16) similar to a cone. In this case, the sawdust will be forced against the surrounding wall of the duct 34 and will thus form a seal preventing steam losses. The rate at which sawdust is moved from the hopper 2a into the conveyor trough 1 can be exactly controlled by the speed of the conveyor screw 35.

Another embodiment of the invention in which the conveyor trough 1 extends into the superheater 6, is shown in Fig. 3. In this case, the side walls 1a of the conveyor trough are exposed to the steam which is produced in the superheater 6 so that the walls 1a are heated to the temperature of said steam. Owing to the comparatively high temperature of the side walls 1a of the conveyor trough 1, condensation producing deposition of used sawdust on the walls of the conveyor trough 1 is avoided. By a natural, intensive scavenging with steam the trough is kept clean and does not require attention. A similar embodiment is shown in Fig. 5, where the conveyor trough 1 is not disposed over the heater 21 but laterally offset so that sawdust particles falling through apertures 5 fall into a container 15 and not into the superheater.

In the embodiment shown in Fig. 4, the side walls 1a of the conveyor trough 1 are disposed outside the superheater 6.

Fig. 6 shows an apparatus for cooling the vapourous smoking fluid below its boiling point. The cooling device 41 comprises a pipe coil 43 for the smoking fluid. This coil is disposed in the coolant container 42. A coolant supply conduit 44 incorporates a solenoid valve 45 and opens into the coolant container 42. An outlet 46 is provided in the upper portion of the coolant container 42. The temperature sensing element 47 of a temperature controller 48 for controlling the solenoid valve 45 extends into the coolant container 42. By the opening and closing of the solenoid valve, a temperature set at the temperature controller 48, is maintained constant. The pipe coil 43 may be connected, e.g. directly to the outlet 8 of the housing 7 of the apparatus described hereinbefore so that the smoking fluid is liquefied immediately after it has been made and can then be stored.

Instead of the conveyor trough 1 shown in the drawings and having a U-shaped cross-section, a conveyor trough may be used which has a closed rectangular, oval, cylindrical or similar cross-section, provided that it is formed with apertures for the discharge of the steam from the conveyor trough 1. Such apertures may be disposed opposite to the bottom apertures 5. Other means for conveying the sawdust may be provided, such as a revolving grate.

Another aspect of the invention is concerned with the use of a smoking fluid produced according to the process and/or by the apparatus described hereinbefore for smoking foodstuffs such as meat, sausage, ham or the like. This process is characterised according to the invention in that the material to be smoked is boiled during the smoking treatment. Contrary to the known processes, in which the material to be smoked is first smoked and then boiled, the need for an additional boiling treatment is entirely eliminated and owing to the liquid or vapourous state of the smoking fluid the smoking treatment and the boiling treatment can be combined so that substantial time is saved.

According to Fig. 7 an apparatus according to the invention comprises a conveyor trough 101, which is rectangular in cross-section and has side walls 101a disposed in a sealed chamber 102, which communicates with a steam superheater 106, which is disposed under the conveyor trough 101. Water is evaporated in a continuous evaporator 127, which is disposed under the superheater 106. The resulting steam is fed to the superheater 106 through an opening 128 in a partition 129.

The conveyor trough 101 has openings for the entrance of steam from the superheater 106 into the conveyor trough 101 only in the lower portion of the side walls 101a of the trough. The sawdust moving through the conveyor trough 101 is thus uniformly supplied with steam from both sides and is possibly utilised better than in the case where steam enters through apertures in the bottom of the trough only.

The junctures 103 from the side wall 101a to the bottom 104 of the conveyor trough 101 are rounded so that low sliding friction of the sawdust flowing through the conveyor

trough 101 is obtained.

In the embodiment shown in fig. 8 the upper portions of the side walls 101b of the conveyor trough diverge upwardly and the apertures 105 for the entrance of the steam are formed only in the parallel lower portions of the conveyor trough 101.

Although the term "sawdust" has been used throughout this specification it will be appreciated that the invention can utilize any substance made up of particles or fragments of wood notwithstanding the fact that these particles may not be made by the cutting of wood by a saw.

WHAT I CLAIM IS:—

1. A process of producing a smoking fluid for smoking foodstuffs, which process comprises contacting a stream of particulate wood solids located in a trough with superheated steam at a temperature of at least 180°C to effect a thermal decomposition of said wood solids and form said smoking fluid, and moving said wood solids along the trough so that the spent wood solids which have been thermally decomposed by the steam are replaced by unspent wood solids.

2. A process as set forth in claim 1 in which said wood solids are contacted with superheated steam at a temperature in the range 250-390°C.

3. A process as set forth in claim 1 or 2 in which said smoking fluid is removed as a vapour from said wood solids and is saturated to a moisture content of approximately 100% at a temperature in the range 70-100°C.

4. A process as set forth in claim 3, in which said smoking fluid is removed as a vapour from said wood solids and is saturated to a moisture content of approximately 100% at a temperature of 80°C.

5. A process as set forth in any one of claims 1 to 4, which comprises admixing a neutral gas with said superheated steam before contacting the same with said wood solids.

6. A process as set forth in claim 5, in which said neutral gas is air.

7. A process as set forth in any one of claims 1 to 4, in which said smoking fluid is removed as vapour from said wood solids and a neutral gas is admixed with said vapour.

8. A process as set forth in claim 7, in which said neutral gas is water vapour.

9. A process as set forth in claim 7, in which said neutral gas is air.

10. A process as set forth in any one of the preceding claims including liquefying the smoking fluid after forming same.

11. A process as set forth in any one of the preceding claims in which the stream of said wood solids is moved continuously.

12. A process as set forth in any one of the preceding claims in which said stream of wood solids is supplied from a hopper.

13. A process as set forth in any one of the preceding claims, in which said stream of wood solids is supplied at a controlled rate.

14. A process as set forth in claim 11, in which said stream of wood solids forms a layer which has a lower portion supplied with said superheated steam and which is of a height such that an uppermost portion of said layer is not subjected to said thermal decomposition, said smoking fluid being withdrawn from said layer through said uppermost portion thereof so that said uppermost portion acts as filter.

15. A process as set forth in claim 10, in which said smoking fluid is withdrawn from said wood solids and is liquefied at a temperature above 0°C.

16. A process as set forth in any one of the preceding claims in which said superheated steam is passed upwards through said wood solids.

17. A process of smoking foodstuffs comprising the process as set forth in any one of the preceding claims, and passing said smoking fluid as a vapour to and condensing said vapour on, said foodstuffs.

18. A process of smoking foodstuffs comprising the process as set forth in any one of the preceding claims and intermittently supplying said smoking fluid as a vapour to said foodstuffs in timed intervals.

19. A process of smoking foodstuffs comprising the process as set forth in any one of the preceding claims and supplying said smoking fluid as a vapour to said foodstuffs, withdrawing surplus smoking fluid vapour from said foodstuffs and condensing same in water.

20. A process of smoking foodstuffs comprising the process as set forth in any one of claims 1 to 15 saturating the smoking fluid with moisture and contacting boiling foodstuffs with the moisture saturated smoking fluid.

21. A process as set forth in claim 20, in which said foodstuffs are boiled in a chamber and said smoking fluid is supplied into said chamber.

22. Apparatus for producing a smoking fluid for smoking foodstuffs, which comprises a trough defining a steaming zone, a steam source for supplying superheated steam at a temperature of at least 180°C. to said steaming zone and a feeder for feeding particulate wood solids along said trough to said steaming zone to contact the solids with said steam.

23. Apparatus as set forth in claim 22, in which said feeder comprises a hopper connected to the inlet end of said trough.

24. Apparatus as set forth in claim 23,

in which said trough is mounted so as to permit of adjustment of its inclination.

25. Apparatus as set forth in claim 23, in which said feeder comprises a conveyor screw disposed between said hopper and said inlet end and a motor operable to drive said conveyor screw.

26. Apparatus as set forth in claim 25, including means for varying the speed of said conveyor screw.

27. Apparatus as set forth in claim 25, including a duct containing said conveyor screw and connecting said hopper to said inlet end and having an inside diameter corresponding substantially to the crest diameter of said screw.

28. Apparatus as set forth in claim 27, in which the root diameter of said conveyor in the direction from said hopper to said inlet end.

29. Apparatus as set forth in claim 27, in which the root diameter of said conveyor screw increases in the direction from said hopper to said inlet end.

30. Apparatus as set forth in any one of claims 23 to 29 including limiting means for limiting the height of the stream of said wood product in said trough.

31. Apparatus as set forth in claim 30, in which said limiting means comprise a plate adapted to contact the surface of said stream.

32. Apparatus as set forth in any one of claims 23 to 31, in which said trough has a discharge end opposite to said inlet end and in which a container for collecting exhausted wood solids is disposed under said discharge end.

33. Apparatus as set forth in any one of claims 23 to 32, in which said trough is open-topped and has a bottom formed with apertures through which said steam source communicates with said trough.

34. Apparatus as set forth in claim 33, in which said bottom consists of a wire mesh screen.

35. Apparatus as set forth in claim 33, including a controllable superheater disposed under the apertures in the bottom of said trough.

36. Apparatus as set forth in claim 35, including a controlled steam supply conduit opening into said superheater.

37. Apparatus as set forth in claim 35, in which said trough has a discharge end opposite to said inlet end and in which a container for collecting exhausted wood solids is disposed under said discharge end, and an insulated housing containing said trough, superheater and container and formed with an outlet opening for the smoking fluid.

38. Apparatus as set forth in claim 35 including an evaporator directly preceding said superheater.

39. Apparatus as set forth in claim 23, in which said trough has a closed cross-section and is formed with steam outlet openings.

40. Apparatus as set forth in claim 23, in which said trough extends through a superheater adapted to contain steam and the outside surfaces of said trough are directly exposed to said steam in said superheater.

41. Apparatus as set forth in claim 40, in which said superheater contains a heater, said trough is laterally offset from said heater, said superheater has a housing, said trough has a bottom formed with openings, and said housing accommodates a container arranged under said openings.

42. Apparatus as set forth in claim 23, in which said trough has lateral openings through which it communicates with said steam source.

43. Apparatus as set forth in claim 42, in which said trough has a side wall which has an upwardly and outwardly extending upper portion.

44. Apparatus as set forth in claim 42, in which said trough has a bottom and side walls and rounded junctures from said bottom to said side walls.

45. Apparatus as set forth in claim 42, which comprises means for limiting the height of the stream of said wood solids in said trough to less than the height of said trough.

46. Apparatus as set forth in claim 22, in which said trough is downwardly inclined from said feeder.

47. Apparatus as set forth in claim 22, in which said trough is mounted for vibrating movement and there is a vibrator operable to vibrate said trough.

48. Apparatus as set forth in claim 47, in which said vibrator is an electromagnetic vibrator.

49. Apparatus as set forth in claim 22, including means vibratably mounting said feeder and a vibrator operable to vibrate said feeder.

50. Apparatus as set forth in claim 49 in which said vibrator is an electromagnetic vibrator.

51. Apparatus as set forth in claim 22, in which said means defining a steaming zone is formed with an opening and which comprises a cooling device arranged to receive said smoking fluid through said opening from said steaming zone and adapted to cool said smoking fluid to below its boiling point.

52. Apparatus as set forth in claim 51, in which said cooling device comprises a coolant container, a pipe coil connected to said opening, a coolant supply conduit connected to said coolant container, a solenoid valve incorporated in said coolant supply

conduit, and a temperature controller for controlling said valve in response to the temperature of the coolant in said container.

53. A process for producing a smoking fluid for smoking foodstuffs substantially as hereinbefore described.

54. Apparatus for producing a smoking fluid for foodstuffs substantially as hereinbefore described with reference to and as shown in Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Figs. 7 or Fig. 8 of the accompanying drawings.

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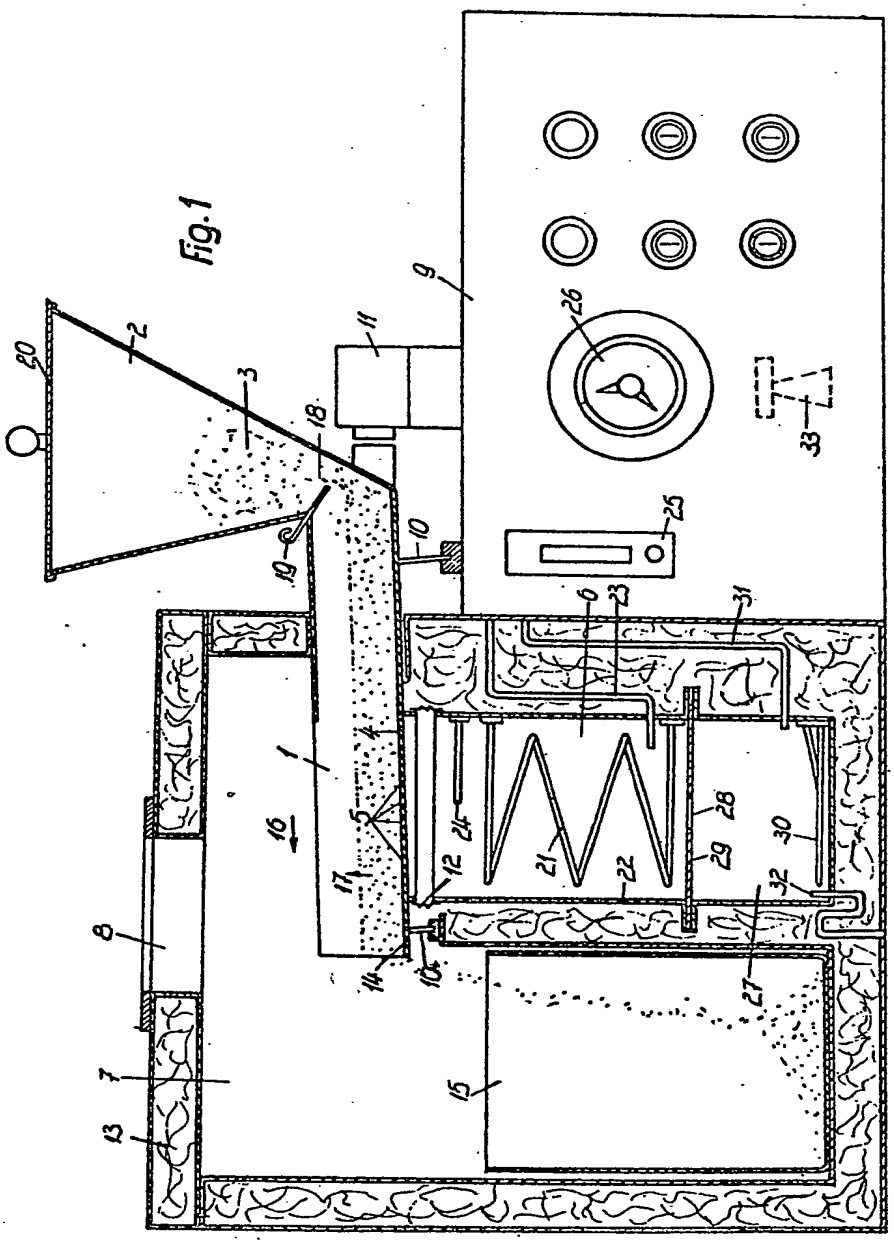
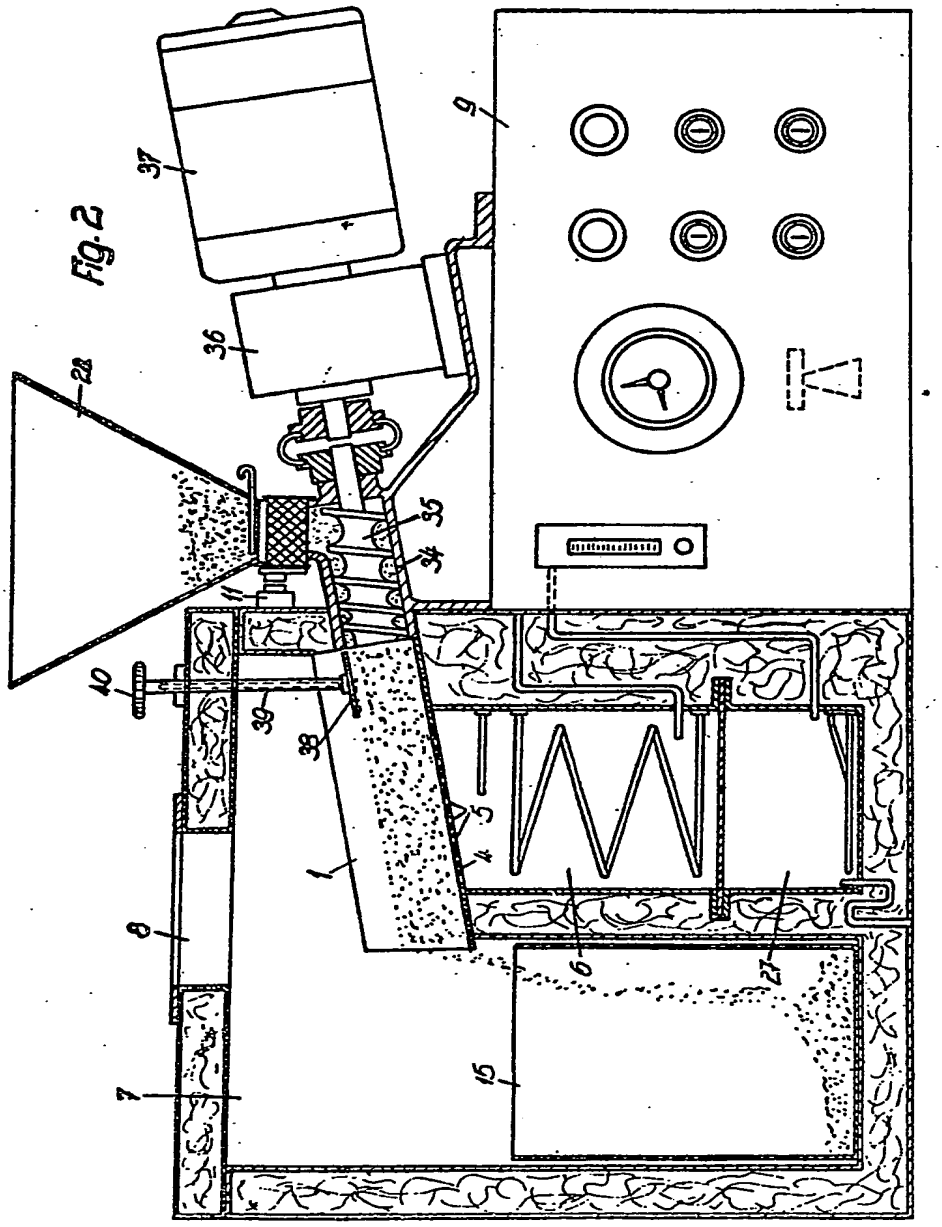
Fig. 1



1,137,637 COMPLETE SPECIFICATION
4 SHEETS

Fig. 2



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SHEETS 1 & 2

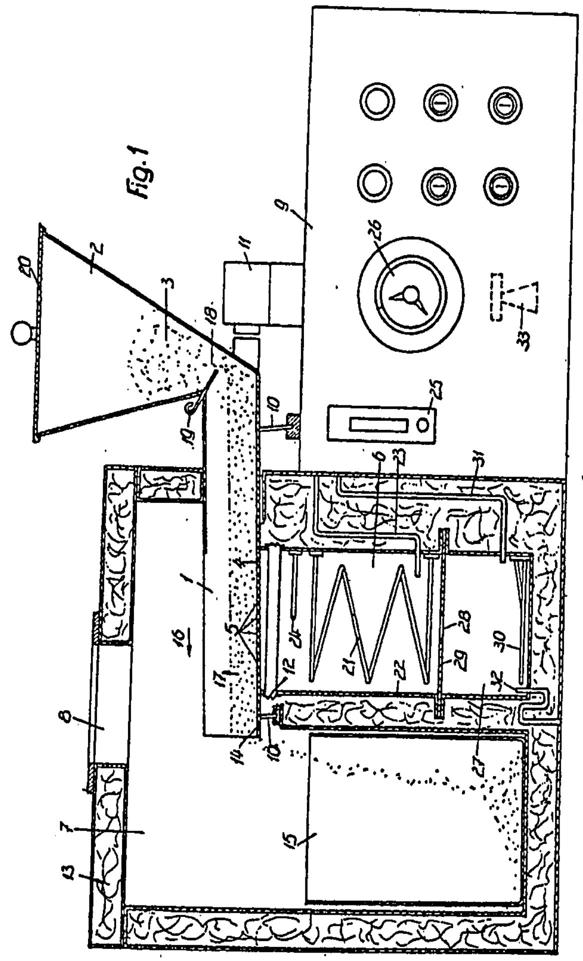


Fig. 1

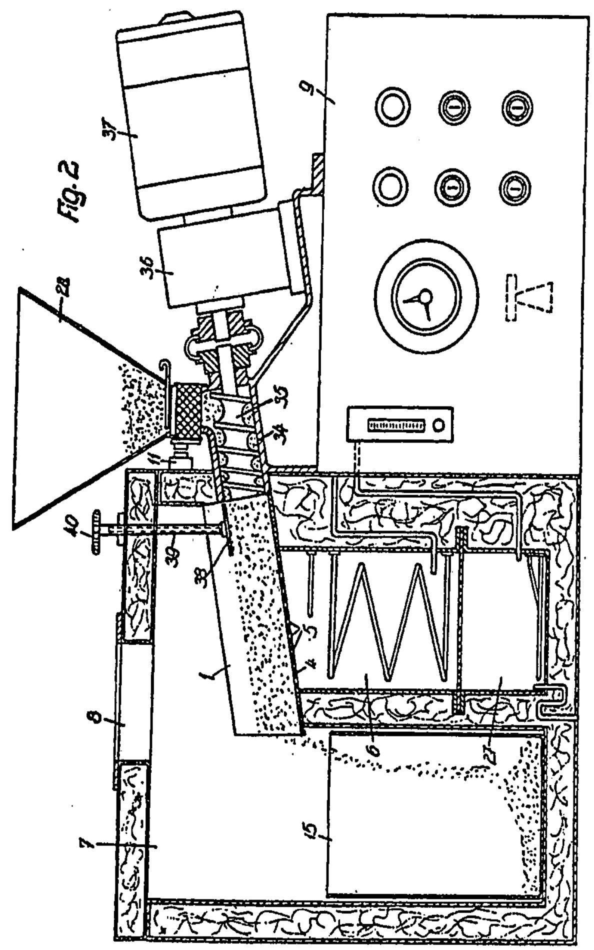


Fig. 2

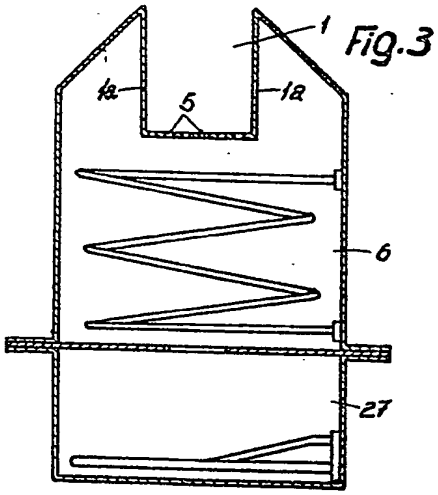
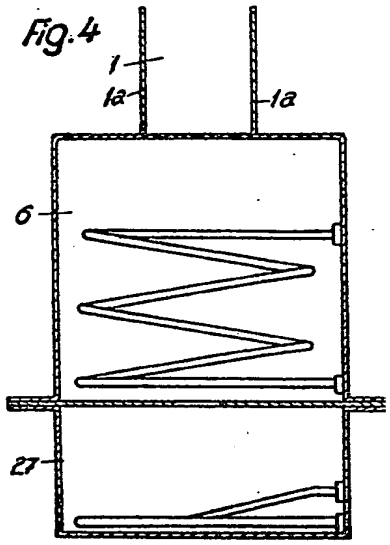
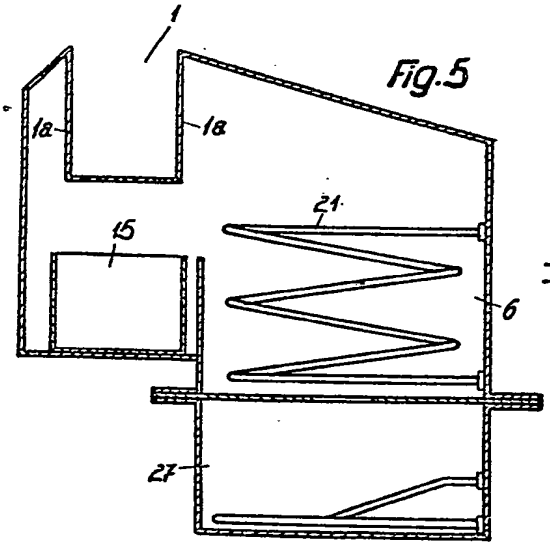
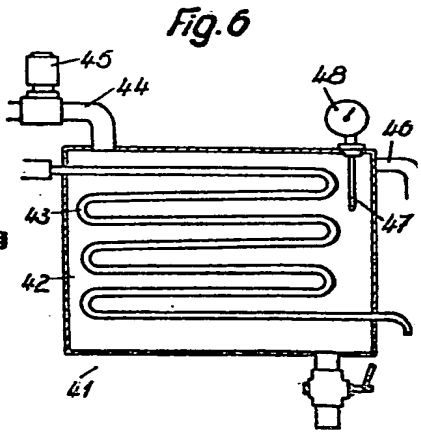


Fig.3







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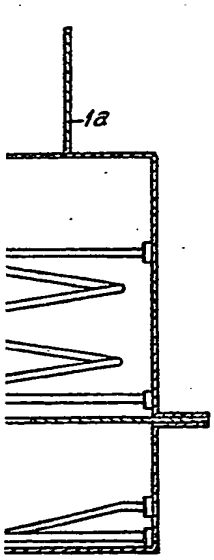
SHEETS 3 & 4

Fig. 7



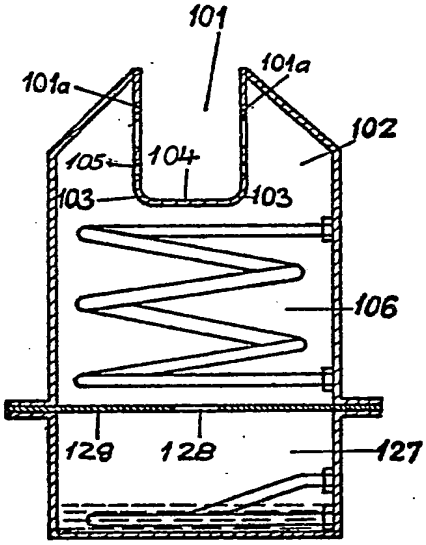
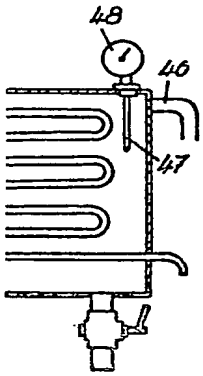


Fig. 8

6



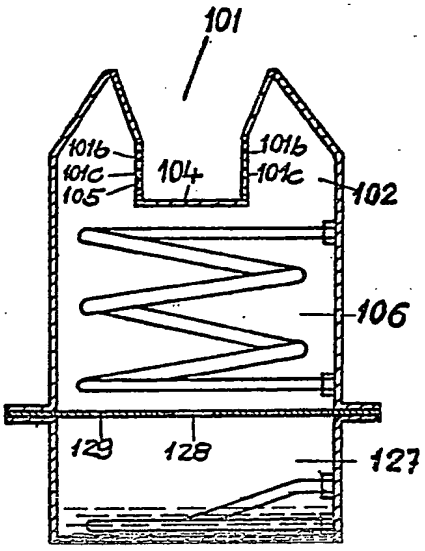


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Fig.3

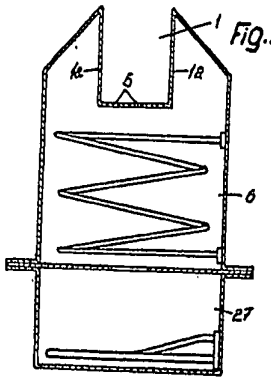

Fig.4

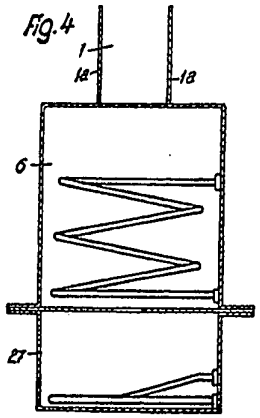

Fig.5

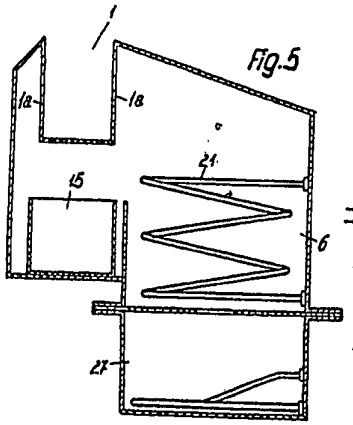

Fig.6

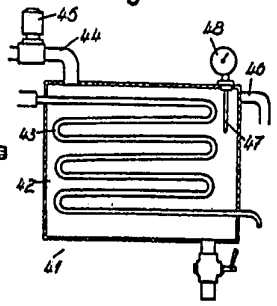

Fig.7

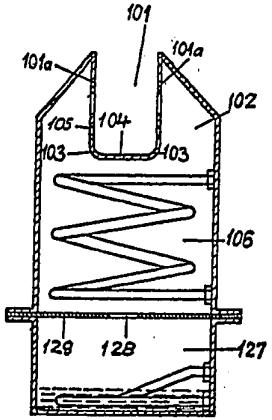

Fig.8